

METROPOLITAN STATE UNIVERSITY OF DENVER  
Office of Academic and Student Affairs

**REGULAR COURSE SYLLABUS**

College of: Professional Studies

Department: Engineering and Engineering Technology

Prefix & Course Number: CPE 3330 Crosslisted With\*: \_\_\_\_\_

Course Title: Digital Systems II

Transcript Course Title (30 characters): Digital Systems II

Check All That Apply: Required for Major: X Required for Minor: \_\_\_\_\_ Specified Elective: \_\_\_\_\_

Required for Concentration: \_\_\_\_\_ Elective: \_\_\_\_\_ Service Course: \_\_\_\_\_

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

**Federal Credit Hour Definition:** A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:  
(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)

Credit Hours: 3 (2+2) Schedule Type: B Grade Mode: L

Face-to-Face or Equivalent Hours per course:

Lecture 30 Lab 30 Internship \_\_\_\_\_ Practicum \_\_\_\_\_ Other (please specify type and hours): \_\_\_\_\_

Additional Student Work Hours per course: 90

Variable topics umbrella course: No X Yes \_\_\_\_\_ If yes, number of credits/repeats allowed \_\_\_\_\_

Specified repeatable course: No X Yes \_\_\_\_\_ If yes, number of credits/repeats allowed \_\_\_\_\_

Prerequisite(s): CPE 2310 with a grade of "C" or better

Corequisite(s): \_\_\_\_\_

Prerequisite(s) or Corequisite(s): \_\_\_\_\_

**Banner Enforced Coding:**

**Prerequisite(s):** CPE 2310 with a grade of "C" or better

**Corequisite(s):** \_\_\_\_\_

**Prerequisite(s) or Corequisite(s):** \_\_\_\_\_

**Registration restrictions:** Level \_\_\_\_\_ Class \_\_\_\_\_ Program/Major \_\_\_\_\_ Student attribute \_\_\_\_\_

**Catalog Course Description:**

This course is a continuation of CPE 2310. It covers the analysis and design of sequential (counters and shift registers) logic systems. Programmable Logic Devices (PLD) and associated Computer Aided Design (CAD) software are used to implement digital circuits by using the schematic design entry method. The general methods of analysis and design for Finite State Machine (FSM) is also introduced.

**Specific Variable Topics Course Description (if applicable, umbrella course description included above):****Required Reading and Other Materials will be equivalent to:**

1. Floyd, Thomas. (2015). *Digital Fundamentals*, 11<sup>th</sup> Edition or current edition. Upper Saddle Hill, NJ: Pearson Education
2. Hamblen, James O., Hall, Tyson S., Furman, Michael D. (2005). *Rapid Prototyping of Digital Systems*, 1<sup>st</sup> Edition or current edition. New York, NY: Klumer Academic (Optional)

**Specific, Measurable Student Behavioral Learning Objectives:**

Upon completion of this course the student should be able to:

1. Analyze, design, build and troubleshoot complex logic circuits within a team environment, utilizing digital Integrated Circuit (IC) technology and PLD hardware
2. Utilize integrated development environment that includes design and PLD software to implement complex digital logic circuits
3. Independently design a complex logic circuit and present the circuit and findings in written and oral format

**Detailed Outline of Course Content or Outline of Field Experience/Internship (experience, responsibilities and supervision):**

- I. Programmable Logic Devices (PLD)
  - A. Simple PLDs and Complex PLDs
  - B. Altera CPLDs or Similar Devices
  - C. Altera Macrocells or Similar Devices
  - D. Altera MAX 7000 Family of CPLDs or Similar Devices
- II. Programmable Logic Device Software
  - A. Quartus II or Similar CAD System

- B. Initiating a PLD Project
  - C. Schematic Design Entry
  - D. Pin Assignment and Design Compilation
  - E. Design Simulation
- III. Programmable Logic Device Development Board
- A. Development Board Specification
  - B. Development Board Resources
  - C. Programming the Development Board PLD
  - D. Testing and Troubleshooting the Designed PLD Circuit
- IV. Counters
- A. Asynchronous Counters
  - B. Synchronous Counters
  - C. Up/Down Counters
  - D. Design of Unique Sequence Counters
  - E. Cascaded Counters
  - F. Counter Applications
- V. Shift Registers
- A. Serial In / Serial Out Shift Registers
  - B. Serial In / Parallel Out Shift Registers
  - C. Parallel In / Serial Out Shift Registers
  - D. Parallel In / Parallel Out Shift Registers
  - E. Bi-directional Shift Registers
  - F. Shift Register Applications
- VI. Memory Devices
- A. Semiconductor
  - B. Magnetic
  - C. Optical
- VII. Finite State Machine
- A. Basic Concept of Finite State Machine (FSM)
  - B. Analyze Simple FSM
  - C. Design Simple FSM

**Evaluation of Student Performance:**

1. Examinations
2. Written Lab Reports
3. Written Assignments
4. Design Demonstrations